

## Claremont Colleges Scholarship @ Claremont

---

Pomona Faculty Publications and Research

Pomona Faculty Scholarship

---

1-1-2012

# Review: An Operator Approach to the Rational Solutions of the Classical Yang-Baxter Equation

Gizem Karaali

*Pomona College*

---

### Recommended Citation

MR2674841 (2012c:16112) Zhang, Qiang; Bai, Chengming, An operator approach to the rational solutions of the classical Yang-Baxter equation. Rep. Math. Phys. 65 (2010), no. 2, pages 165–187. (Reviewer: Gizem Karaali)

This Review is brought to you for free and open access by the Pomona Faculty Scholarship at Scholarship @ Claremont. It has been accepted for inclusion in Pomona Faculty Publications and Research by an authorized administrator of Scholarship @ Claremont. For more information, please contact [scholarship@cuc.claremont.edu](mailto:scholarship@cuc.claremont.edu).

**MR2674841 (2012c:16112)** 16T25 (81R12)

**Zhang, Qiang** (PRC-NNK-MCI); **Bai, Chengming [Bai, Cheng Ming]** (PRC-NNK-MCI)

**An operator approach to the rational solutions of the classical Yang-Baxter equation.**

(English summary)

*Rep. Math. Phys.* **65** (2010), no. 2, 165–187.

The authors study the rational solutions of the Classical Yang-Baxter Equation following the operator approach pioneered by M. A. Semenov-Tian-Shanskiĭ [Funktsional. Anal. i Prilozhen. **17** (1983), no. 4, 17–33; [MR0725413 \(85i:58061\)](#)] and B. A. Kupershmidt [J. Nonlinear Math. Phys. **6** (1999), no. 4, 448–488; [MR1722068 \(2001a:17023\)](#)]. They provide explicit constructions and pose questions for further work. The paper is well-motivated and clearly written.

Reviewed by [Gizem Karaali](#)

## References

1. L. D. Faddeev and L. Takhtajan: The quantum inverse scattering method of the inverse problem and the Heisenberg XYZ model, *Russ. Math. Surv.* **34** (1979), 11–68.
2. L. D. Faddeev and L. Takhtajan: *Hamiltonian Methods in the Theory of Solitons*, Springer, Berlin 1987. [MR0905674 \(89m:58103\)](#)
3. A. A. Belavin: Dynamical symmetry of integrable quantum systems, *Nucl. Phys. B* **180** (1981), 189–200. [MR0609841 \(82j:81053\)](#)
4. I. M. Gelfand and I. Ya Dorfman: Hamiltonian operators and the classical Yang–Baxter equation, *Funct. Anal. Appl.* **15** (1982), 173–181. [MR0684122 \(84e:58030\)](#)
5. M. A. Semenov-Tian-Shansky: What is a classical r-matrix? *Funct. Anal. Appl.* **17** (1983), 259–272.
6. M. A. Semenov-Tian-Shansky: Classical r-matrices and quantization, *J. Soviet Math.* **31** (1984), 3411–3416.
7. M. A. Semenov-Tian-Shansky: Dressing transformations and Poisson–Lie group actions, *Publ. Res. Inst. Math. Sci.* **21** (1985), 1237–1260. [MR0842417 \(88b:58057\)](#)
8. M. A. Semenov-Tian-Shansky: Quantum and classical integrable systems, *Lect. Notes Phys.* **495**, Springer, Berlin 1997, p. 314–377. [MR1636298 \(99f:58106\)](#)
9. T. Skrypnyk: Generalized Gaudin spin chains, nonskew symmetric r-matrix and reflection equation algebras, *J. Math. Phys.* **48** (2007), 113521. [MR2370264 \(2008j:82015\)](#)
10. V. Chari and A. Pressley: *A Guide to Quantum Groups*, Cambridge University Press, Cambridge 1994. [MR1300632 \(95j:17010\)](#)
11. A. A. Belavin and V. G. Drinfel’d: Solutions of classical Yang–Baxter equation for simple Lie algebras, *Funct. Anal. Appl.* **16** (1982), 159–180. [MR0674005 \(84e:81034\)](#)
12. A. A. Belavin and V. G. Drinfel’d: Classical Young–Baxter (sic) equation for simple Lie algebras, *Funct. Anal. Appl.* **17** (1984), 220–221.
13. V. Drinfel’d: Hamiltonian structure on the Lie groups, Lie bialgebras and the geometric sense

- of the classical Yang–Baxter equations, *Soviet Math. Dokl.* **27** (1983), 68–71.
14. A. Stolin: *On rational solutions of the classical Yang–Baxter equation*, Thesis, Matematiska Institutionen, Stockholms Universitet (1991).
  15. A. Stolin: On rational solutions of Yang–Baxter equation for  $sl(n)$ , *Math. Scand.* **69** (1991), 57–80. [MR1143474 \(93d:17023\)](#)
  16. A. Stolin: Constant solutions of Yang–Baxter equation for  $sl(2)$  and  $sl(3)$ , *Math. Scand.* **69** (1991), 81–88. [MR1143475 \(93b:17053\)](#)
  17. M. Aguiar: Pre-Poisson algebras, *Lett. Math. Phys.* **54** (2000), 263–277. [MR1846958 \(2002k:17041\)](#)
  18. K. Ebrahimi-Fard: Loday-type algebras and the Rota–Baxter relation, *Lett. Math. Phys.* **61** (2002), 139–147. [MR1936573 \(2004b:17003\)](#)
  19. K. Ebrahimi-Fard, L. Guo and D. Kreimer: Integrable renormalization I: The ladder case, *J. Math. Phys.* **45** (2004), 3758–3769. [MR2095671 \(2006b:81183\)](#)
  20. G. Baxter: An analytic problem whose solution follows from a simple algebraic identity, *Pacific J. Math.* **10** (1960), 731–742. [MR0119224 \(22 #9990\)](#)
  21. G.-C. Rota: Baxter algebras and combinatorial identities I, *Bull. Amer. Math. Soc.* **75** (1969), 325–329. [MR0244070 \(39 #5387\)](#)
  22. G.-C. Rota: Baxter algebras and combinatorial identities II, *Bull. Amer. Math. Soc.* **75** (1969), 330–334. [MR0244070 \(39 #5387\)](#)
  23. H. H. An and C. M. Bai: From Rota–Baxter algebras to pre-Lie algebras, *J. Phys. A: Math. Theor.* **41** (2008), 015201. [MR2450698 \(2009g:16045\)](#)
  24. B. A. Kupershmidt: What a classical  $r$ -matrix really is, *J. Nonlinear Math. Phys.* **6** (1999), 448–488. [MR1722068 \(2001a:17023\)](#)
  25. M. Bordemann: Generalized Lax pairs, the modified classical Yang–Baxter equation, and affine geometry of Lie groups, *Comm. Math. Phys.* **135** (1990), 201–216. [MR1086757 \(91k:58049\)](#)
  26. C. M. Bai: A unified algebraic approach to the classical Yang–Baxter equation, *J. Phys. A: Math. Theor.* **40** (2007), 11073–11082. [MR2396216 \(2009b:17014\)](#)
  27. X. Xu: An Analogue of the classical Yang–Baxter equation for general algebraic structures, *Monatshefte Math.* **119** (1995), 327–346. [MR1328822 \(96g:58089\)](#)
  28. J. Lepowsky and H. S. Li: *Introduction to Vertex Operator Algebras and their Representations*, Birkhäuser, Boston 2004. [MR2023933 \(2004k:17050\)](#)
  29. V. G. Drinfel’d: On constant quasiclassical solutions of the quantum Yang–Baxter equation, *Soviet Math. Dokl.* **28** (1983), 667–671.

*Note: This list reflects references listed in the original paper as accurately as possible with no attempt to correct errors.*